

Saguaro National Park

INTRODUCTION



Art Explosion

Saguaro cactus dominates the landscape at Saguaro National Park.

Saguaro National Park is in southern Arizona, near Tucson. It is part of the Sonoran Desert of southern California, Arizona, and northwestern Mexico. This is one of the most diverse and, by desert standards, the lushest of North American [deserts](#). The desert is named for the huge [saguaro](#) (suh•WHAH•roh) cactus that dominates the landscape.

The Sonoran Desert was first inhabited by the Tohono O'Odham Indians. They were drawn to the area by the sweet fruit of the saguaro cactus. In 1933 the extensive forest of saguaros east of Tucson was made a national monument by President Herbert Hoover, to preserve the desert icon. The winter of 1937 was very cold, and some of the saguaros were damaged by frost. The skin of the cacti blistered, and some died. People thought that the freeze damage was a disease, and they worried that all saguaros were at risk. This led to the preservation of the saguaro forest to the west of Tucson. Most of the saguaros in the western section of Saguaro National Monument were younger than those in the eastern section.

[Cattle](#) grazing was still allowed in the area, and the cattle trampled young saguaros. In the late 1950s all cattle were removed, and the saguaros were allowed to regrow. Because of their slow growth rate, they are still recovering. Today the saguaros are either very young or very old, with few middle-age cacti.

In November 1961, President Kennedy signed a bill and expanded the monument to include Tucson Mountain Park. In 1975, 28,900 hectares (71,400 acres) of the Saguaro Wilderness Area was added. On October 14, 1994, Saguaro National Park was established from the Saguaro National Monument and Saguaro Wilderness Area for a total of 37,000 hectares (91,400 acres).

In addition to the saguaro desert flora and fauna, the park includes ancient Tohono O'Odham campsites and petroglyphs and remnants of ranching, mining, and homesteading.



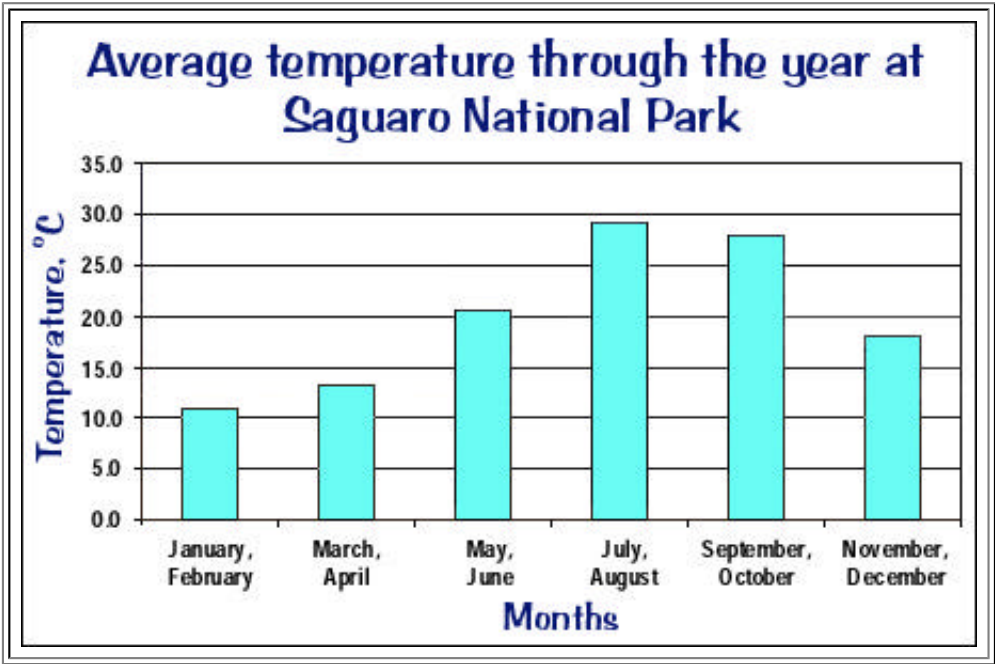
Art Explosion

A dramatic sunset silhouettes saguaro cacti.

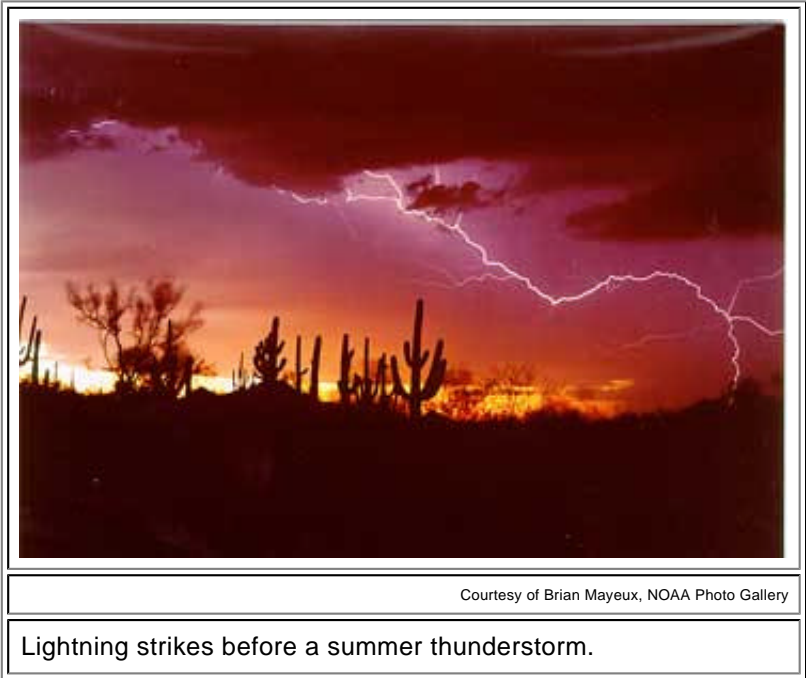
Tucson, Arizona, is surrounded by Saguaro National Park. Many people say that the desert is especially beautiful after it rains. After a storm, you can smell the [creosote](#) bushes, which some people say "smell like the desert." Saguaro National Park had 3.4 million visitors in 1999. Because of its proximity to Tucson, some of the roads in the park are used as shortcuts by commuters traveling to homes on the borders of the park.

ABIOTIC DATA

The Sonoran Desert is hot. Summer temperatures can range from 38 to 46°C (100 to 115°F) with extremes to 49°C (120°F). Evenings quickly cool to lows around 27°C (80°F). Winters are mild, with daytime temperatures of 16–21°C (60–70°F) and evening lows of 4°C (39°F). Upper elevations occasionally see freezing temperatures. Southern Arizona is a favorite winter vacation destination for people escaping from a harsh northern winter.

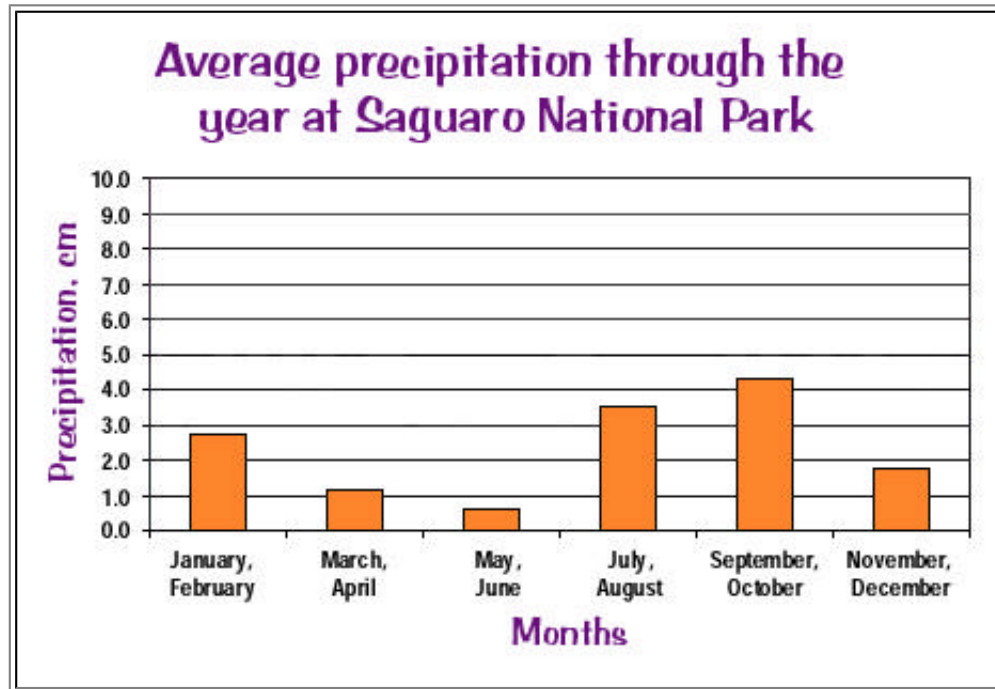


July begins the rainy season and peaks in September. Powerful thunderstorms are fed by moist winds from the Gulf of Mexico. Despite the dramatic monsoon rainy season, the Sonoran Desert receives only 2.5–36 centimeters (1–14 inches) of rain each year. Saguaro National Park usually receives about 25 centimeters (10 inches) per year. Mountains that surround the park create a rain shadow, and the air loses most of its moisture before reaching the park.



The soil in Saguaro National Park is shallow, reddish, sandy soil. Rainfall quickly evaporates or is absorbed by



desert plants.



BIOTIC DATA

All ecosystems depend on the Sun for energy, but organisms in the Sonoran Desert survive in spite of the Sun and its intense heat. Plant and animal life is abundant in Saguaro National Park and throughout the Sonoran Desert. Organisms are adapted to this harsh environment. Despite the intense sunlight, the growing season in the desert is short because of the lack of water.

The most dominant organism is the large [saguaro cactus](#). It can grow up to 15 meters (49 feet) tall. Its huge humanlike shape dwarfs everything else, including humans. The time needed by the cactus to reach those amazing heights can exceed 100 years. A saguaro cactus may grow only 0.6 centimeter (0.25 inch) during its first year and may need as many as 30 years to reach 1 meter (3 feet). It begins to flower after about 55 years. The distinctive arms do not appear until the cactus is between 50 and 100 years old.

	
Art Explosion	Courtesy of Anne Marie Gearhart
Humans are dwarfed by giant saguaro cactus.	Thorns grow along the pleats of a saguaro cactus.

During the rainy season, saguaros absorb huge amounts of water. Their accordian shape expands to hold more water, and a thick, waxy epidermis slows transpiration.



Mixed with the saguaros are [mesquite trees](#), ocotillo, [creosote bushes](#), [barrel cactus](#), [prickly pear](#), and [grama grass](#). Each has its own adaptation for collecting and storing water. Cacti photosynthesize with the epidermis layer of their stems. Thorns are leaves that have shrunk over time. The thorns also protect cacti by discouraging animals from browsing on their water-rich tissues.

Some long-lived plants, such as [mesquite trees](#) and [creosote bushes](#), have exceptionally long roots to reach water deep in the earth. Other plants, including prickly pear and saguaro cactus, have shallow, netlike roots to help capture water from the brief rains.

Soils in the desert are generally poor. In many places the ground is covered with a thin rocky layer called desert pavement. It is a layer of pebbles and small rocks. All the surrounding sand has been blown or washed away, leaving a surface that looks as if it was placed there on purpose. Desert pavement may take thousands of years to form. Directly beneath the layer of pebbles is a thin layer of soil that contains organic material. This layer is rich in [cyanobacteria](#) (blue-green algae), and may support substantial growths of [algae](#), [lichens](#), and mosses.

	
Art Explosion	Art Explosion
Thorns protect cacti by preventing animal browsing.	Flowers bloom from modified stems of a prickly pear.

Many young plants, such as the [saguaro](#), cannot tolerate the intense desert sun. They grow only under nurse plants, which shade them in early life. The seedlings grow in the shade of a [mesquite tree](#) or [creosote bush](#). It may take a saguaro 50 years to grow taller than its nurse plant. Some plants live their whole lives in the shade of a nurse plant.



	
Courtesy of Bureau of Land Management	Courtesy of Anne Marie Gearhart
The desert tortoise spends the hottest part of the day in its burrow and emerges in the early morning or late afternoon to feed on grasses and seeds.	A saguaro grows near creosote and mesquite trees that may have served as nurse trees for the young cactus.

During the day, the desert seems quiet, except for the occasional bird or the deafening buzz of [cicadas](#). A closer look might reveal [black-tailed jackrabbits](#) or a [collared peccary](#) resting in the shade of a saguaro. Few animals

venture out during the heat of the day. Reptiles, such as the [western diamondback rattlesnake](#), can be found sunning in the morning, but they will retreat to shade during the heat of the day. [Red-tailed hawks](#) glide on hot thermal wind currents, and [roadrunners](#) dart across open spaces, each searching for food.



As night approaches and temperatures cool, the desert becomes alive. At dusk or dawn you might see a [coyote](#). Cactus flowers open. [Mexican long-tongued bats](#) and [white-lined sphinx moths](#) emerge, seeking nectar and fruit. Even the desert floor appears alive as [scorpions](#) and other insects come out of their hiding places in search of water and food. After a summer rain, thousands of black and green-striped [hornworms](#) (sphinx moth larvae) begin a mass migration across the desert floor.

[Desert tortoises](#) escape intense daytime heat by estivating, which is similar to hibernating, in burrows. Estivating animals burrow underground and appear to be asleep or dead. Animals may also have adaptations that help them cope with the lack of water. Desert tortoises, [kangaroo rats](#), and other desert animals can go a long time without drinking water. They get all the water they need from the plant stems or seeds that they eat.

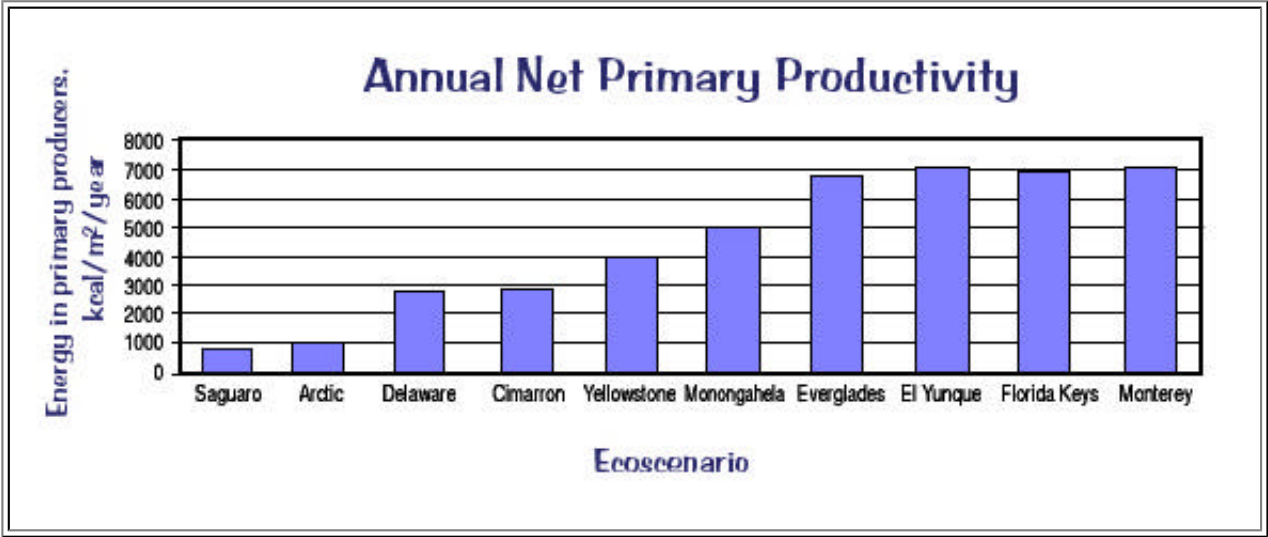
	
Art Explosion	Art Explosion
Summer rains trigger a mass migration of hornworms.	Scorpions seek dark, cool spaces during the day.

During the late summer, Saguaro National Park gets more rain than can seep quickly into the ground. The water creates temporary rivers in the usually dry washes. Diversity of plants and animals along washes is particularly high.

Plants that live for only a few weeks may have seeds that lie dormant for years, waiting for just the right environmental conditions. When the rain comes, these seeds sprout and grow quickly into fields of wildflowers, such as [desert paintbrush](#), [firewheel](#), and [morning glory](#). They complete their life cycle before the moisture disappears and the temperature gets too hot. These flowers are called ephemeral because their blooming season is so short. Yellow [creosote](#) flowers and flame-orange ocotillo flowers brighten the desert and give it a distinctive smell for a few brief weeks following a good soaking.

	
Courtesy of Anne Marie Gearhart	Courtesy of Anne Marie Gearhart
Cacti have adaptations to reduce water loss. The spines are actually reduced leaves.	Photosynthesis occurs in the stems of prickly pear cactus instead of in its leaves. Flowers bloom on ends of stems. They will ripen to bright red fruit.

Even though Saguaro National Park is lush compared to other deserts, the annual productivity, or the amount of energy provided by the producers in this ecosystem, is very low, only 390 kilocalories/square meter/year of plant material. The harsh environmental conditions make it difficult for plants to grow.



ISSUES



Saguaro National Park is a small section of the larger Sonoran Desert ecosystem. A national park is a protected area, and rangers have the authority to prevent off-road vehicle use within its boundaries. But the ecosystem does not stop at the boundaries, and animals are not contained in fences like a zoo.

Off-roading in the desert

Off-road vehicles (ORV) are any type of motor-driven vehicle designed for use where there aren't roads. These vehicles include sport utility vehicles, all-track trucks, all-terrain vehicles, and motorcycles. In snowy areas, ORVs

include snowmobiles. On the water, jet skis are considered ORVs.

Off-road driving has become a favorite past time for people living near the desert. In 1997 there were 48,900 ORVs registered in Arizona. People like to drive ORVs in the desert because it is dry and the terrain is fun.

	
Art Explosion	Courtesy of Bureau of Land Management
Some national parks and wilderness areas have roads that are specifically designated for four-wheel drive and off-road use.	Off-road vehicles travel along a well-worn dirt road.

The desert floor may look flat, but it actually has parallel ridges. Rainwater from seasonal storms moves sand as it drains off the desert floor. This creates ridges. Driving across the desert floor can feel like you are driving across a giant rippled potato chip. Spaces between cacti and other plants are often not big enough for ORVs to pass easily. Some people enjoy the challenge of figuring out how to drive across the ridged ground through all the plants. Other people enjoy racing on hillsides or dunes. Some people are out to explore, and like to drive up washes. Washes are good places to look for animal life, because sometimes there are ponds of water left from rains.

The continued ORV use has long-term effects on the desert. Vegetation is torn up, desert pavement is destroyed, and soil is compacted. Rainwater cannot be absorbed in the compacted soil, and with no vegetation to hold it, water quickly flows away. This increases erosion and sediment flowing into rivers.

Animals that burrow cannot dig into compacted soil. Animals, such as [desert tortoises](#) and [horned lizards](#), are camouflaged by sandy soil. They are often overlooked or mistaken for rocks. Desert tortoises move too slowly to escape speeding vehicles, and many are killed.

What has happened

ORV advocates and conservationists came to a compromise over off-roading in some popular desert areas. At Imperial Dunes, near San Diego, California, an off-roading organization was able to keep the dunes from being included in the Desert Protection Act. This act closed 2.8 million hectares (7 million acres) to off-roading in southern California.

The amount of land available to off-roading may be changing. In 2000, just before leaving office, President Clinton signed the Roadless Initiative, declaring 24 million hectares (60 million acres) as roadless areas. This restricts access to about 31% of the wilderness areas controlled by the U.S. Forest Service for ORVs. New roads cannot be built in these wilderness areas. The Roadless Initiative changes the mission of the U.S. Forest Service. While it used to be involved in multiple uses of the forest lands, like logging, grazing, and recreation, the Forest Service will now focus on preserving wilderness areas. Implementation of the Roadless Initiative is still being reviewed by President Bush's administration in 2003.

THE DEBATE

Before making decisions that affect an ecosystem, it is important to gather information from a variety of sources. Below are the views of several individuals or groups that have an interest in the future of Saguaro National Park and deserts of the southwest United States. After each quote the hyperlink goes to the original source of the quote. Refer to these sites for more information.

Use the information provided to decide where you stand on this debate.

DEBATE: Should off-roading be allowed in deserts like Saguaro National Park?

People who think off-road use should not be restricted

Sport hunter in the Sonoran Desert

"The BLM sets up rules for off-roaders to follow and if everyone is careful there isn't any damage to the land."

Santa Catalina Ranger District, Tucson, Arizona, Off-Highway Vehicles

"The Forest Service roads in Santa Catalina Ranger District offer some of the best off-highway outdoor recreation opportunities available in Tucson. These roads provide an opportunity to visit the broad natural diversity ranging from the saguaro cactus-studded Sonoran desert floor to the Sky Island mountain range...If you choose to drive these low-standard roads, be prepared to encounter rocks and boulders, road washouts, downed trees, brush encroaching on the roadway. Always be prepared to stop for wildlife or cattle in the roadway. When you open a closed gate, always close that gate behind you."

<http://www.fs.fed.us/r3/coronado/scrd/rec/ohv/ohv.htm>

John Brabyn, The Image Problem of Off-Road Travel

"The popular image of 4WD vehicle users as yahoos who tear up the landscape by irresponsible trail blazing and vehicular acrobatics is, happily, now largely a myth. In my many thousands of miles of desert travel on dirt roads and trails, I have yet to witness such behavior. (No doubt there are still a few who are irresponsible— just as there are irresponsible backpackers.) The reality is that people nowadays use their 4WD vehicles as a means to access, explore and appreciate the great, remote natural areas of the back country. The vehicle users I have met in these areas are responsible appreciators of nature who adhere to the Tread Lightly principles—a set of common-sense rules for low-impact travel by vehicle."

<http://home.earthlink.net/~cyberkiwi/environment/>

Tread Lightly on Public and Private Lands, TreadLightly! Information

"Tread Lightly! is dedicated to protecting public and private lands through education. Emphasis is placed on responsible use of off-highway vehicles, other forms of backcountry travel and low impact principles applicable to all recreation activities. Through educational materials, editorial coverage, and manufacturer-generated advertising and promotions, Tread Lightly! has been able to urge outdoorsmen to be responsible toward the environment and to help preserve future opportunities for outdoor recreation."

<http://www.4x4u.com/pub/k2/treadlightly!/tlinfo.htm>

Officer with the Arizona Game and Fish Department

"We want to help people learn to be responsible with off-highway use. This will help keep lands open for recreation."

Arizona Game and Fish Department, Off-Highway Vehicle Program

"The purpose of the Arizona Game and Fish Department's Off-Highway Vehicle Safety and Habitat Protection Program is to promote safe, responsible, and ethical off-highway vehicle use while emphasizing protection of environmental resources."

http://159.87.132.194/outdoor_recreation/off_highway.html

People who think off-road use should be stopped in the desert

Resident near Saguaro National Park

"I've seen how off-road use has changed the Mojave Desert in California and I don't want it to look like that around here."

Fault Line, case study, Near Red Rock Canyon State Park

"In some areas, intense use has stripped all but the largest shrubs from the hillsides and carved deep ruts into the landscape. Unmanaged riding has caused the fragile desert soil to run downhill in huge quantities during rainstorms, burying what vegetation remains at the bottom of slopes."

<http://www.faultline.org/news/2001/07/shoreoffroad2.html>

Jennifer Haley and David Bainbridge, National Park Service, Desert Restoration: Do Something or Wait a Thousand Years

"While historical photos, written descriptions and air photos can provide a good first look at above-ground disturbance patterns, some of the most important impacts of human activities are the often unseen effects at and below ground level. There are physical, hydrologic, chemical and biological changes after disturbance which make conditions much less favorable for soil microbes and plants. These changes include reduced infiltration and fertility, increased compaction and soil strength, increased erosion and reduced biological activity."

<http://www.werc.usgs.gov/mojave-symposium/abstracts.html#9>

Kristin H. Berry and Philip Medica, National Biological Service, Desert Tortoises in the Mojave and Colorado Deserts

"Within the United States, desert tortoises live in the Mojave, Colorado, and Sonoran deserts of southeastern California, southern Nevada, southwestern Utah, and western Arizona...The U.S. government treats the desert tortoise as an indicator or umbrella species to measure the health and well-being of the ecosystems it inhabits. The tortoise functions well as an indicator because it is long-lived, takes 12–20 years to reach reproductive maturity, and is sensitive to changes in the environment...Higher than normal losses or mortality rates were attributed to many causes, such as illegal collecting, vandalism, upper respiratory tract disease or shell disease, predation by common ravens, crushing by vehicles both on and off roads, and trampling by livestock."

<http://biology.usgs.gov/s+t/noframe/d284.htm>

American Lands, Off-Road Vehicles: A Growing Threat to Public Lands and Waters: Environmental Impacts: Soil and Vegetation

"When ORV users leave established roads and trails, the machines create new paths through forests. Some riders drive their vehicles straight up ravines and hillsides, through the desert, and across streams and grasslands. This contributes to soil compaction, destruction of vegetation, and the spread of noxious weeds."

<http://www.americanlands.org/forestweb/offroad.htm>

Questions

- Which side of this debate do you support?
- What scientific evidence supports your position?
- After looking at the evidence, did you change your position? Please explain why.

WEB LINKS

National Park Service, Saguaro National Park - <http://www.nps.gov/sagu/>

ABCnews.com, *Off the Beaten Track* - <http://abcnews.go.com/sections/us/DailyNews/suvs990907.html>

American Lands, *Off-Road Vehicles: A Growing Threat to Public Lands and Waters: Environmental Impacts: Soil and Vegetation* - <http://www.americanlands.org/forestweb/offroad.htm>

Arizona Game and Fish Department, *Off-Highway Vehicle Program* - http://159.87.132.194/outdoor_recreation/off_highway.html

Bureau of Land Management in California, *Imperial Dunes Draft Management Plan Available for Comment* - http://www.ca.blm.gov/news/2002/03/nr/CDDnews33_imperial_dunes_draft_management_plan.html

Desert Tortoise Council - <http://www.deserttortoise.org/>

Desert Tortoise Preserve Committee - <http://www.tortoise-tracks.org/gopherus.html>

Fault Line, case study, *Near Red Rock Canyon State Park* - <http://www.faultline.org/news/2001/07/shoreoffroad2.html>

Friends of Saguaro National Park - <http://www.friendsofsaguaro.org/welcome.html>

Jennifer Haley and David Bainbridge, National Park Service, *Desert Restoration: Do Something or Wait a Thousand Years* - <http://www.werc.usgs.gov/mojave-symposium/abstracts.html#9>

John Brabyn, *The Image Problem of Off-Road Travel* - <http://home.earthlink.net/~cyberkiwi/environment/>

Kristin H. Berry and Philip Medica, National Biological Service, *Desert Tortoises in the Mojave and Colorado Deserts* - <http://biology.usgs.gov/s+t/noframe/d284.htm>

National Park Service, Saguaro National Park, *Bicycle Trail Closed at Saguaro National Park* - http://www.nps.gov/sagu/press/press_release.htm

Natural Trails and Waters Coalition - http://www.naturaltrails.org/issues/factsheets/fs_usfs.html

Open Lands/Off Road Vehicles Subcommittee Meeting, Pima County Department of Environmental Quality Conference Room, Tucson, Arizona - <http://www.deq.co.pima.az.us/air/pcneap/pdf/NEAP1-24.PDF>

Saguaro Juniper Corporation, Information and Images - http://www.saguaro-juniper.com/i_and_i/i_and_i.html

Saguaro National Park - <http://www.saguaro.national-park.com/>

Santa Catalina Ranger District, Tucson, Arizona, Off Highway Vehicles - <http://www.fs.fed.us/r3/coronado/scrd/rec/ohv/ohv.htm>

Side Canyon Travel Southwest, Saguaro National Park - <http://www.sidecanyon.com/features/deserts2a.htm>

The Sonoran Desert: 5000 Square Miles of Silence - <http://www.oneworldjourneys.com/sonoran/index2.html>

Sonoran Desert Naturalist - <http://arizonensis.org/sonoran/index.html>

Tread Lightly On Public and Private Lands, TreadLightly! Information - <http://www.4x44u.com/pub/k2/treadlightly!/tinfo.htm>

U.S. Department of Agriculture, Forest Service, *Roadless Area Conservation* - <http://www.roadless.fs.fed.us/>

U.S. Geological Survey, *New Study Underscores Fragility of Southern California Deserts* - <http://biology.usgs.gov/pr/newsrelease/1999/10-22.html>

Worth Allen, National Outdoor Leadership School, *The Leader, Issue Room: Roadless Initiative* - <http://www.nols.edu/alumni/leader/02spring/issueroom.shtml>
